

REMARKS

This is in response to the Office Action of July 3, 2007. Claim 1 is amended to recite features from claims 3, 4, 12, and 14. Claim 2 is amended without change of scope for better form. Claim 4 is amended in view of the amendment of claim 1. Claims 3, 12, and 14 are cancelled, without prejudice, in view of the amendment of claim 1. No new matter is introduced by this Amendment. Claims 1, 2, 5-11, 13 and 15-17 as amended are pending in the application.

Objection was raised to claims 2 and 3. Office Action, page 2. Claim 3 has been cancelled, and claim 2 has been amended to obviate the objection.

Claims 1-3, 5, 11, and 15-17 were rejected under 35 U.S.C. § 102 as being anticipated by US 5,965,640 (Kobayashi). Office Action, pages 3-5. Although the Examiner mentions §102(a) in connection with this rejection, Kobayashi issued on October 12, 1999, and accordingly this rejection would be under §102(b). The rejection does not apply to the claims in their present form, since the pending claims all include the features of former claims 12 and 14, which were not rejected as being anticipated by Kobayashi.

Claims 4 and 6-10 were rejected under 35 U.S.C. § 102(b) as being anticipated by, or under 35 U.S.C. § 103(a) as being unpatentable over, the Kobayashi reference. Office Action, pages 5-7. The rejection is respectfully traversed. The present invention differs from the Kobayashi technology in at least the following three ways:

(1) Crosslinking system

In the acrylic rubber composition disclosed in Kobayashi, crosslinking occurs between halogen-based cure sites of a halogen-containing acrylic rubber and a triazine thiol compound. Thus, it is essential that the acrylic rubber composition of Kobayashi comprises a halogen-containing acrylic rubber and a triazine thiol compound.

In contrast, in the acrylic rubber composition of the present invention, crosslinking of the acrylic rubber occurs between the carboxyl cure sites of the acrylic rubber and a polyamine crosslinking agent (page 16, lines 12-23). Thus, the acrylic rubber composition of the present

invention comprises a carboxyl group-containing acrylic rubber comprising units of a monoester of a C₃₋₁₁ α , β -ethylenically unsaturated dicarboxylic acid monomer with a C₁₋₃ alkanol, and a polyamine crosslinking agent.

(2) Acrylic rubber

The acrylic rubber composition disclosed in Kobayashi comprises a halogen-containing acrylic rubber as an essential ingredient, which is prepared by copolymerization of alkyl alkylate and/or alkoxyalkyl alkylate with an active halogen-containing monomer, or by halogenation of a (co)polymer of alkyl alkylate and/or alkoxyalkyl alkylate (column 3, lines 9-28). It is mentioned in Kobayashi that other optional monomers may be copolymerized with the alkyl acrylate and/or alkoxyalkyl acrylate, and many monomers are recited as examples of the optional monomers (col. 4, line 28 to col. 5, line 7). Among the optional monomers, "a monester of an α , β -ethylenically unsaturated dicarboxylic acid monomer having 3 to 11 carbon atoms with an alkanol having 1 to 8 carbon atoms" is included (col. 4, lines 52-54). The halogen-containing acrylic rubber comprises 30-99.9 wt. % of alkyl alkylate and/or alkoxyalkyl acrylate and 0-55 wt. % of the optional monomer (col. 5, lines 9-25).

In contrast, in the present invention, the acrylic rubber comprises 80-99.9 wt. % of acrylic acid ester and/or methacrylic acid ester, and 0.1-20 wt. % of a monoester of a C₃₋₁₁ α , β -ethylenically unsaturated dicarboxylic acid monomer with a C₁₋₃ alkanol.

(3) Silicate Additive

The acrylic rubber of Kobayashi comprises a white filler with a pH of 2-10. The white filler includes, for example, white carbon (silica), Celite, talc, clay, calcined clay and others (col. 8, lines 6-17).

The acrylic rubber composition of the present invention comprises a combination of synthetic silica having a BET specific surface area of not larger than 200 m²/g, with aluminum silicate containing at least 5 wt. % of Al₂O₃, wherein the total amount of Al₂O₃ and SiO₂ is at least 60 wt. % based on the aluminum silicate.

The incorporation of a combination of the specified synthetic silica and the specified aluminum silicate is not specifically disposed in Kobayashi.

One benefit of the acrylic rubber composition of the present invention over the acrylic rubber composition disclosed in Kobayashi lies in excellent storage stability. In this regard, the Examiner should compare Examples 1 and 2 with Comparative Example 1. (Note: Examples 3-5 fall within the scope of original claim 1, but do not fall within the currently amended claim 1).

The acrylic rubber composition in Comparative Example 1 comprises an active chlorine-containing acrylic rubber (i.e., copolymer of n-butyl acrylate, 2-methoxyethyl acrylate and vinyl chloroacetate), 2,4, 6-trimercapto-s-triazine (i.e., triazine thiol compound (2) recited in Kobayashi), and zinc dibutyldithiocarbamate (i.e., a dithiocarbamic acid derivative (3) recited in Kobayashi), and aluminum silicate. Thus, the acrylic rubber composition is similar to that as disclosed in Kobayashi. The factual data shown in Table 1 reveals that the acrylic rubber composition of the present invention (Examples 1 and 2) has excellent storage stability as compared with that of Comparative Example 1.

Therefore, the claimed invention is neither anticipated nor obvious over the Kobayashi reference.

Claims 12 and 13 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Kobayashi in view of US 6,815,506 (Takashima '506). Office Action, pages 7-8. The rejection is respectfully traversed.

As pointed out by the Examiner, Takashima discloses that the examples of inorganic filler for a rubber composition include silica, synthetic aluminum silica and others (col. 8, lines 48-67). However, the rubber composition disclosed in Takashima comprises an unsaturated group-containing acrylic rubber (B) comprising a structural unit derived from a monomer having a carbon-carbon double bond in a side chain (B2), and a crosslinking agent (E) (col. 2, lines 12-30). The examples of the crosslinking agent (E) preferably include sulfur, an organic sulfur-containing compound, and organic peroxides.

Therefore, the acrylic rubber disclosed in Takashima is different from that disclosed in Kobayashi in that the former rubber has carbon-carbon double bonds as the cure sites, but the latter rubber has halogen-based cure sites. Further, these prior art rubbers differ in that the former rubber comprises sulfur, an organic sulfur-containing compound or an organic peroxide as the crosslinking agent, but the latter rubber comprises a triazine thiol compound as the crosslinking agent.

Accordingly, due to the differences in the cure mechanism of the acrylic rubbers between Takashima and Kobayashi, there would be no motivation for substitution of inorganic fillers.

Moreover, it is submitted that Takashima is silent on the incorporation of a combination of the specified synthetic silica and the specified aluminum silicate, as used in the present invention, in the rubber composition. Therefore, even if there is motivation of substitution of inorganic fillers between Takashima and Kobayashi, the acrylic rubber of the present invention comprising a combination of the specified synthetic silica and the specified aluminum silicate would not be obvious.

In addition, it is to be noted that the acrylic rubber composition in Comparative Example 1, as mentioned above, is also similar to a hypothetical combination of Kobayashi with Takashima (that is, the rubber composition comprising a chlorine-containing acrylic rubber, a crosslinking agent as recited in Kobayashi, and aluminum silicate recited in Takashima), and has poor storage stability as compared with that of the present invention.

Accordingly, in view of the amendments to claim 1 and the remarks hereinabove, the rejection of claims 12 and 13 under 35 U.S.C. 103(a) over Kobayashi in view of Takashima '506 should be withdrawn by the Examiner.

Claim 14 was rejected under 35 U.S.C. § 103(a) as being unpatentable over Kobayashi in view of JP 04-126738 (Takashima '738). Office Action, pages 8-9. The rejection is respectfully traversed.

Takashima JP '738 discloses a rubber composition comprising a rubber having carboxylic acid groups and/or carboxylic acid ester groups, and silica having been treated with an amino group-containing organosilane compound (claim 1).

Takashima JP '738 discloses many crosslinking agents for acrylic rubbers. The following is a partial translation of a relevant passage (page 4, left lower column, line 12 to page 5, left upper column, line 12) of Takashima JP '738.

“The crosslinking agent is usually any of those which are used as the crosslinking agent for rubbers and includes sulfur or its derivatives, organic peroxides, alkyl-phenol resins, and ammonium benzoate. Further, as the crosslinking agent, there can be used polyfunctional crosslinking agents having at least two functional groups capable of reacting with crosslinking sites contained in the rubber (A).

The organic peroxide used as the crosslinking agent includes, for example, 2,5-dimethyl-2,5-di(t-butylperoxy)-hexyne-3, ...[partially omitted]....

The polyfunctional crosslinking agents having at least two functional groups capable of reacting with crosslinking sites contained in the rubber (A) preferably include polyfunctional crosslinking agents having at least two functional groups selected from the group consisting of amino group, isocyanate group, maleimide group, epoxy group, hydroxyl group, mercapto group and carboxyl group. As examples thereof, there can be mentioned compounds such as diamines, polyamines, diisocyanates, dithiols, polyisocyanates, maleimides, diepoxides, diols, polyols, bisphenols and dicarboxylic acids.

As specific examples of the above-recited compounds, there can be mentioned N, N'-phenylenedimaleimide, hexamethylene diamine, 2, 2-bis(4'-hydroxyphenyl) propane, 2,2-bis (4'-hydroxyphenyl) hexafluoropropane and triazine trithiol.”

The acrylic rubber disclosed in Takashima JP '738 is different from that disclosed in Kobayashi in that the former rubber has carboxyl groups or carboxylic ester groups as cure sites, but the latter rubber has halogen-based cure sites. Due to the difference in the cure mechanism of acrylic rubbers, there is no motivation of substituting the triazine thiol compound as the

crosslinking agent of Kobayashi by the crosslinking agent of Takashim JP '738. Further, it would not be easy to select a polyamine crosslinking agent from the numerous crosslinking agents recited in Takashim JP '738. Further, it would not be easy to incorporate the polyamine crosslinking agent together with a combination of the specific synthetic silica and the specific aluminum silicate, as used in the present invention, in the rubber.

Takashima JP '738 discloses that the rubber composition has excellent heat resistance, but suggests nothing about storage stability.

Accordingly, claim 1, as well as all claims dependent thereon, are not taught or suggested by the cited prior art in view of the amendments to the claims and in view of the remarks hereinabove.

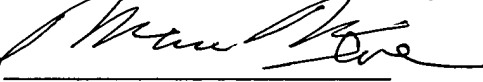
Should there be any outstanding matters that need to be resolved in the present application, the Examiner is respectfully requested to contact Richard Gallagher (Registration No. 28,781) at the telephone number of the undersigned below, to conduct an interview in an effort to expedite prosecution in connection with the present application.

If necessary, the Commissioner is hereby authorized in this, concurrent, and future replies to charge payment or credit any overpayment to Deposit Account No. 02-2448 for any additional fees required under 37.C.F.R. §§1.16 or 1.14; particularly, extension of time fees.

Dated: January 2, 2008

MSW/RG/la

Respectfully submitted,

By 

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